**List of Figures**
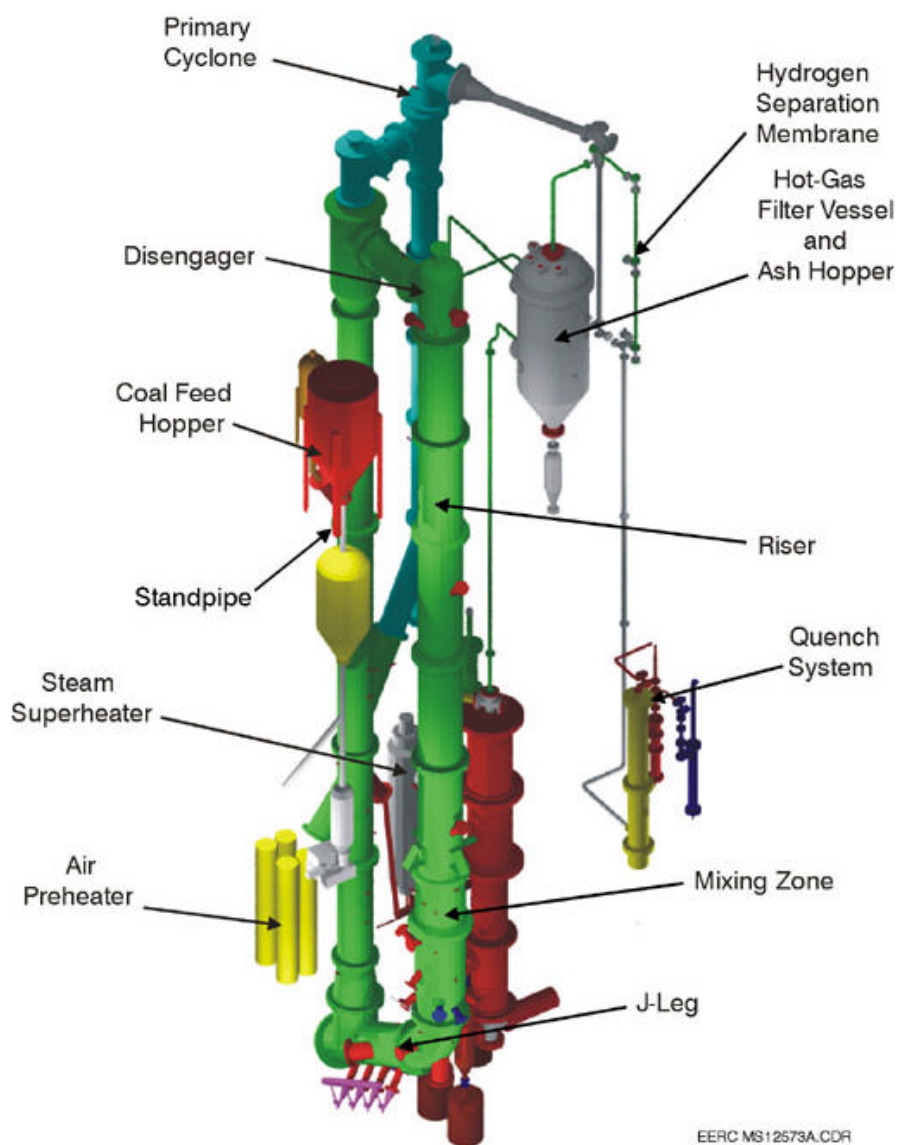
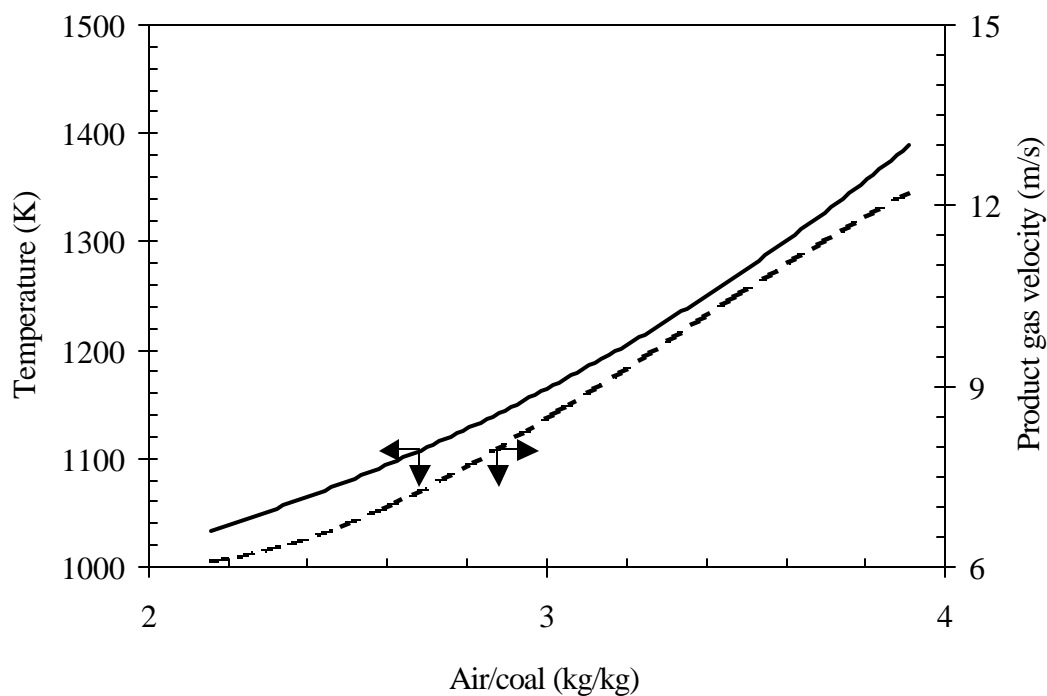Figure 1. Schematic for the Transport Reactor Development Unit.

Figure 2. Simulation of Wyodak coal case predicting the influence of air/coal ratio on the temperature (——) and product gas velocity (----).



Figure 3. Simulation of Wyodak coal case predicting the influence of air/coal ratio on the carbon conversion via combustion, gasification, and devolatilization processes.

Figure 4. Simulation of Wyodak coal case predicting the influence of air/coal ratio on the product gas heating value and composition including $H_2$, $CO$, $CO_2$, and $H_2O$.
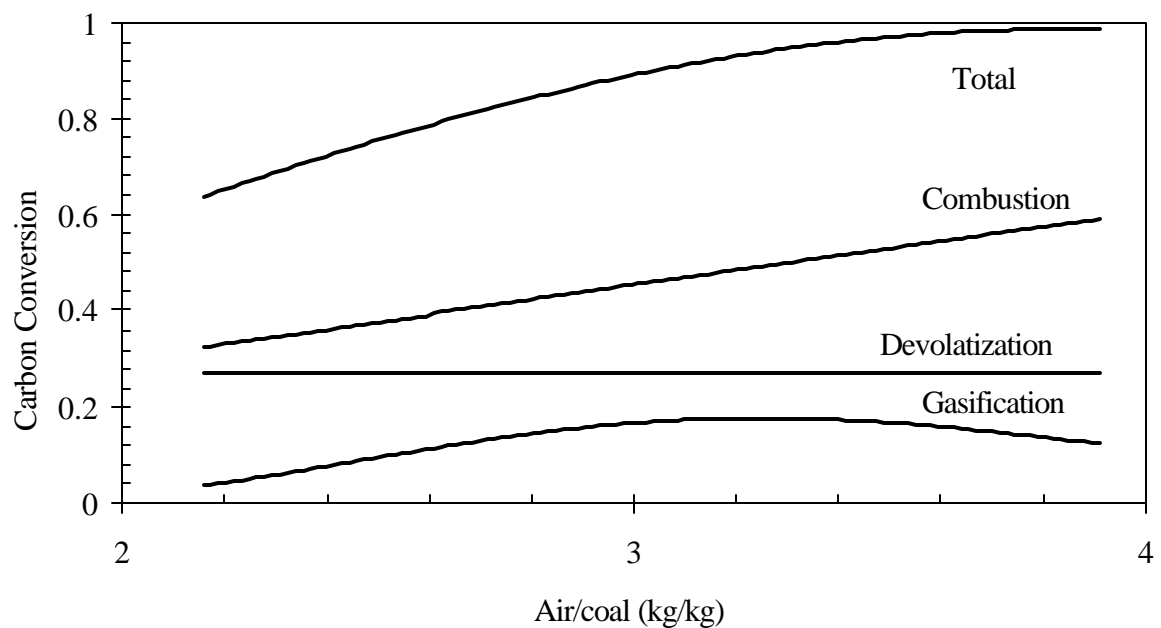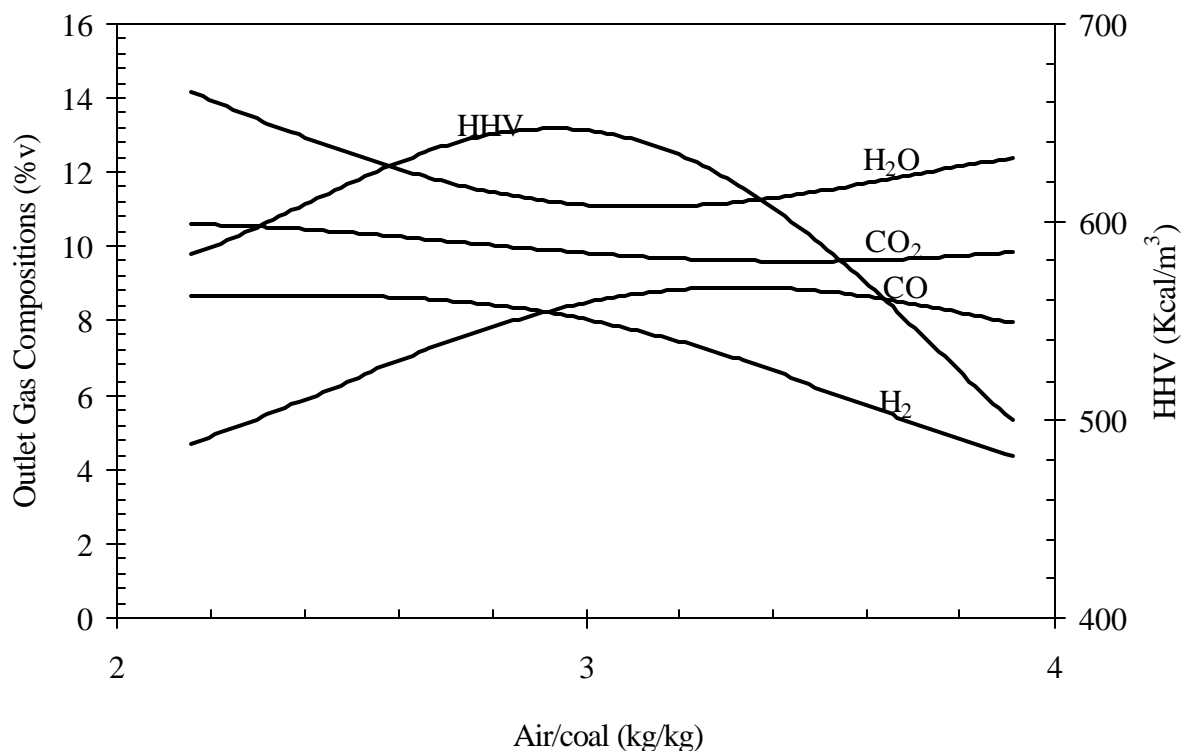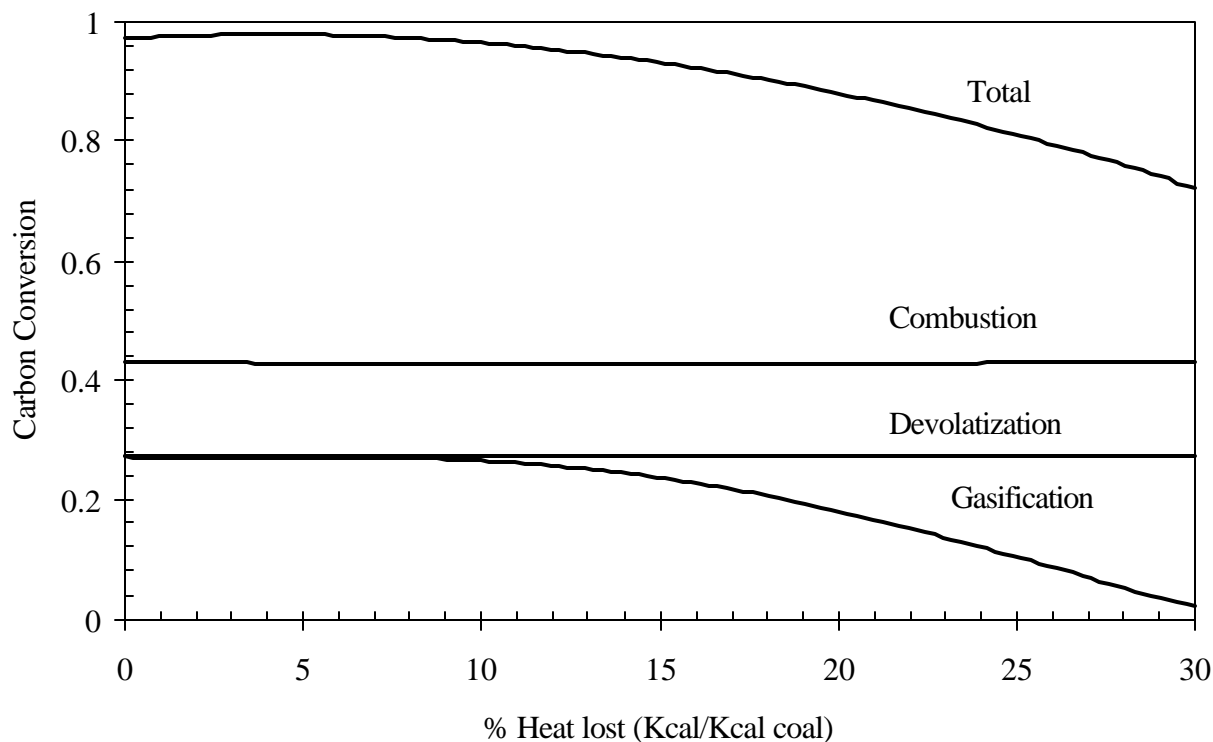


Figure 5. Simulation of Wyodak coal case predicting the influence of heat loss on the carbon conversion via combustion, gasification, and devolatilization processes.
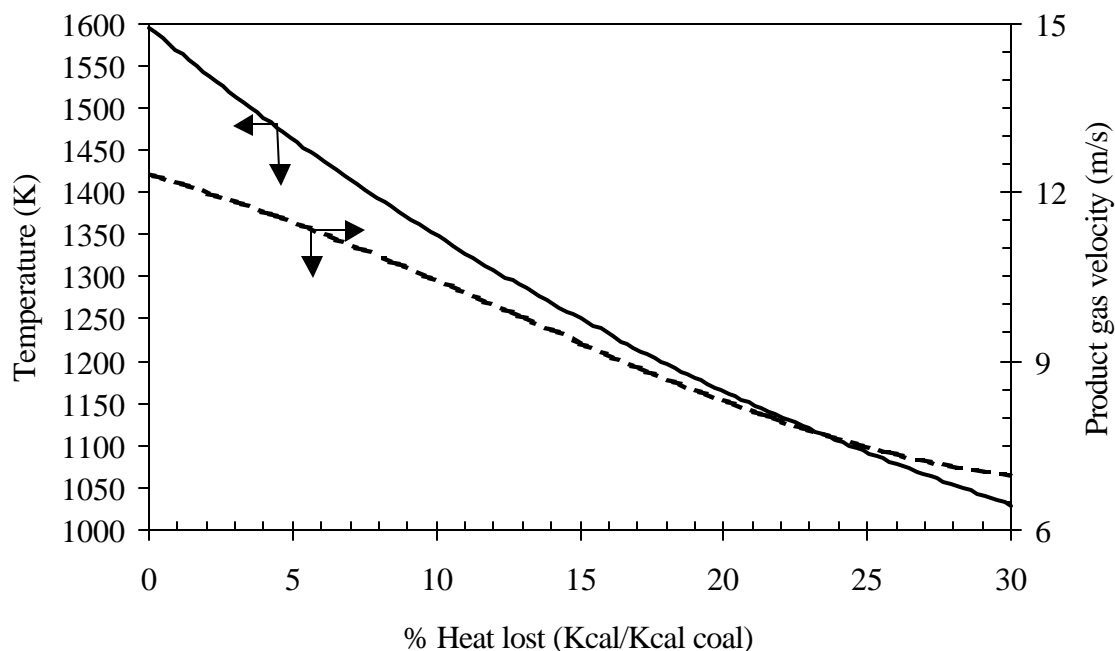
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Figure 6. Simulation of Wyodak coal case predicting the influence of heat loss on the temperature (——) and product gas velocity (----).
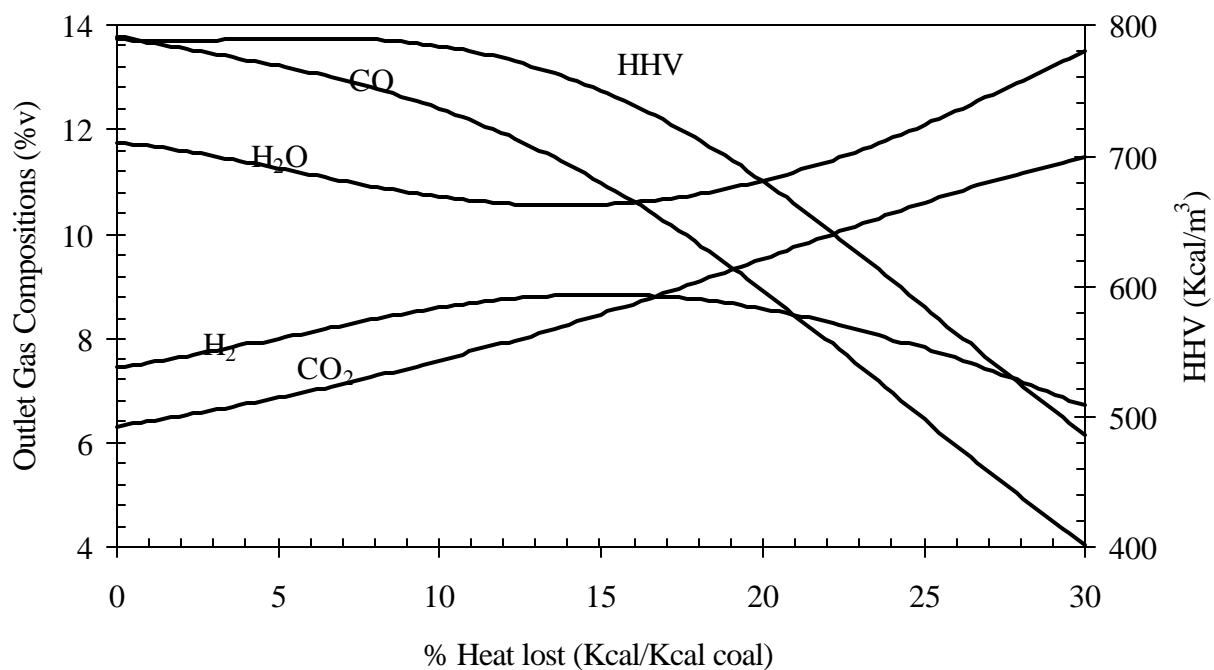
Figure 7. Simulation of Wyodak coal case predicting the influence of heat loss on the product gas heating value and composition including $H_2$, $CO$, $CO_2$, and $H_2O$.
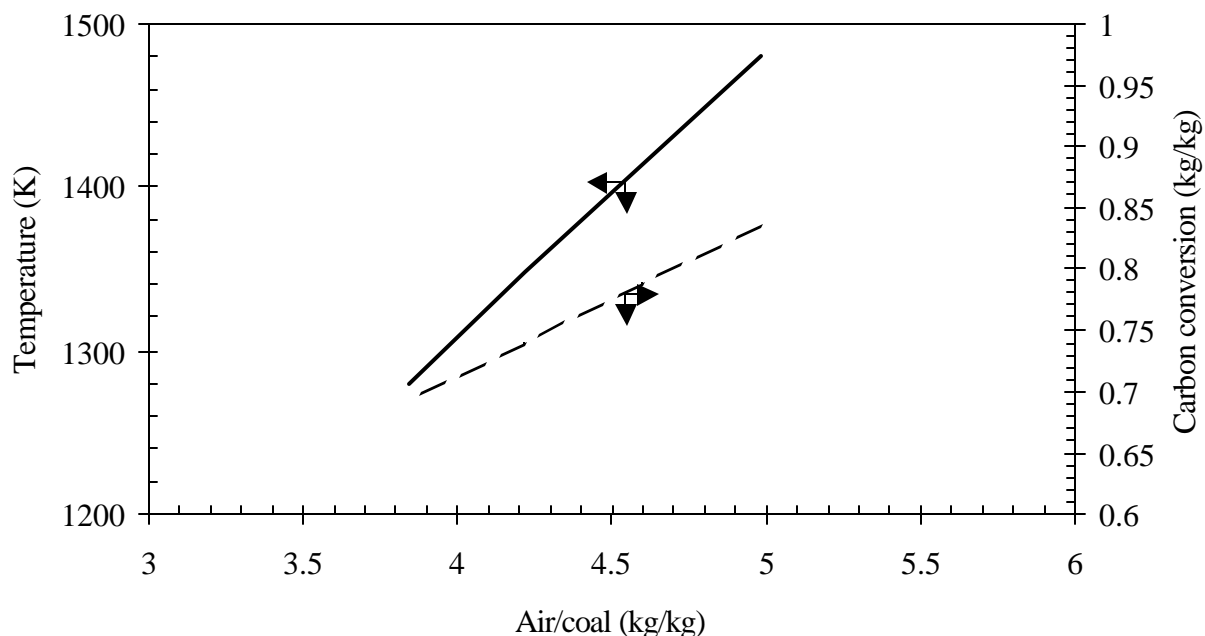
Figure 8. Simulation of Illinois #6 coal predicting the influence of air/coal ratio on the temperature (——) and carbon conversion (----).
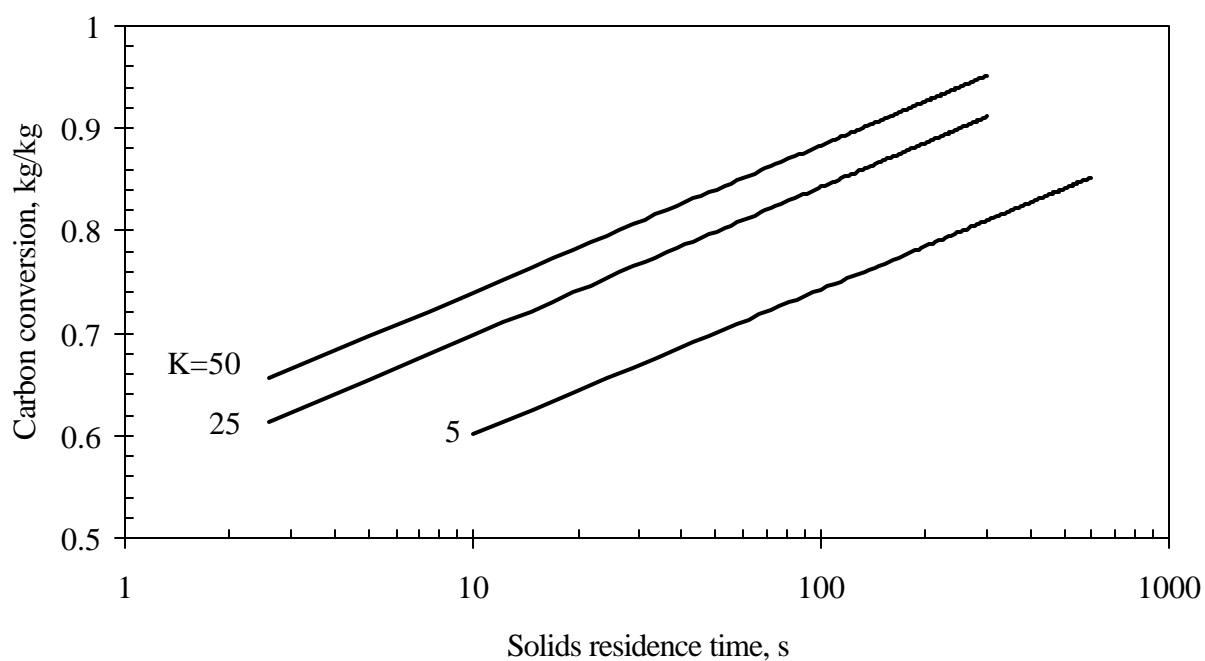


Figure 9. The predicted influence of coal reactivity factor, K, on carbon conversion via gasification using test conditions for the Illinois #6 test case at 1311 K and varying solids residence times.
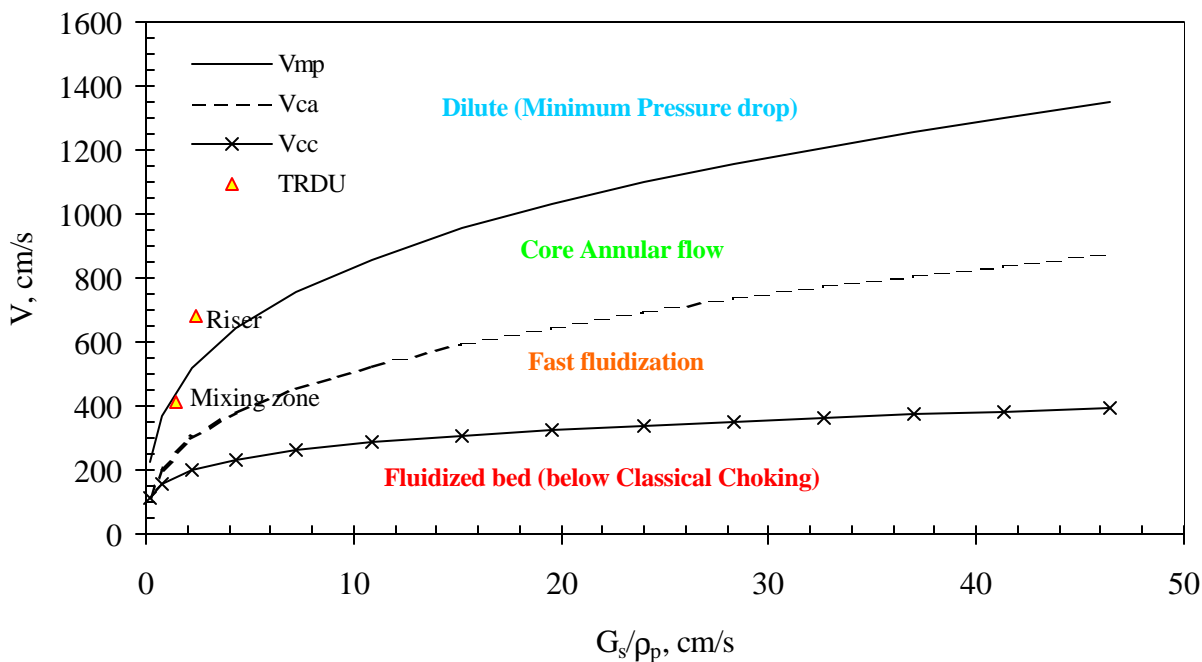
Figure 10. TRDU flow regime map as estimated from Bi and Grace (1995) using Illinois # 6 test conditions and resulting solid and gas flow rates, $d_p$=175 μ, and $\rho_s$=1.4 g/cc. $V_{mp}$ is the velocity limit for minimum $\Delta P$, $V_{ca}$ is the velocity limit for core-annular flow, and $V_{cc}$ is the velocity limit for classical choking.